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malian, have *degenerated* in every direction in the characters of the pelvis.

The limbs of the Pisces are as well adapted to their environment as are those of the land Vertebrata, but from an embryological standpoint, their structure is inferior. The primitive rays are less modified in the fin than in the limb; and limbs themselves display a constantly increasing differentiation of parts, commencing with the Batrachia and ending with the Mammalia. The details of these modifications belong to the history of the contents of the classes however, rather than to the succession of the Vertebrata as a whole.

In review it may be said, that a comparison of the characters which define the classes of the Vertebrates, shows that this branch of the animal kingdom has made with the ages successive steps of progress from lower to higher conditions. This progress has not been without exception, since as regards the construction of the scapular arch, the Mammalia have retrograded from the reptilian standard, as a whole.

In subsequent articles I shall take up the lines of the classes separately.

(*To be continued.*)

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EDITORS' TABLE.

EDITORS: A. S. PACKARD AND E. D. COPE.

——The annual report for 1883–4 of Professor Agassiz to the president and fellows of Harvard College, on the condition of the Museum of Comparative Zoölogy, contains much matter of interest to the naturalist on the subject of the accumulation and care of collections. The director of the museum thinks that it is not advisable to create collections which "must undoubtedly be duplicated in Washington or New York." That portion which relates to the care of the perishable materials contains many suggestive statements. Among these is the information that the large collections of reptiles, fishes, mollusks, Crustacea and echinoderms in alcohol, made by the museum, have become in great degree useless for nice scientific work, and that every year much material has to be thrown away. Such a statement as this must be equally applicable to all museums. That it should be true is greatly to be regretted, and points clearly to the

ERRATUM.

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Page 147, second line from bottom, omit "Batrachia."

necessity of using more efficient methods or materials for preservation in future. While in the language of Professor Agassiz, "Undoubtedly many most interesting problems require large collections for their solution, the cost of maintaining" the collections of perishable specimens "may stagger the most enthusiastic collector." "The function of a museum is without doubt to use its resources in the purchase and care of special collections," but at the same time, "with the present facilities and cost of travel it would be far cheaper for an institution to supply the specialist with the necessary funds for such an investigation" (as that of recent fishes). The general result of these somewhat opposing considerations is, that while there is no limit, excepting that of space, to the extent to which collections of imperishable materials can be carried, it is better not to accumulate collections which may be duplicated elsewhere, or large quantities of perishable specimens. For the study of this class of objects the money of institutions is more profitably expended in furnishing specialists with facilities and fresh materials.

It is evident, however, that even historical collections of perishable material must accumulate. It is also true that students must have such collections as the means of obtaining the education necessary as a preliminary to research, and for the purpose of studying the coarser anatomy. Moreover, while distinctness of character should be sought by every museum, it is not certain what material may or may not be duplicated elsewhere, and every important locality should have its reference collection as complete as circumstances permit. How to do this more perfectly and economically is one of the problems of the day.

—— The School of Biology of the University of Pennsylvania has been established, as we understand, for the purpose, first, of sustaining and conducting original research; and second, to furnish incidentally to this leading object instruction to persons desirous of making of research a pursuit. No measures will be spared to carry these intentions into effect. Such an institution has long been needed in Philadelphia, and the reputation of the city as a factor in the scientific growth of the country is much concerned in it. The possibility of realizing this project is almost entirely due to the generosity of Professor Horace Jayne, who has sustained much of the necessary expense of the establishment. The appropriation of money to forward the intellectual development of a community is one of the most effective ways of elevating it in all respects, as it applies energy to the root of the matter instead of attempting to mend the leaves and fruit. It is a prophylactic, while much of the charity of the world has rather the character of a curative. All students will unite in the hope that Professor Jayne's liberality will meet with the fullest appreciation, and bring him due reward.

—— Communication with our neighboring republic on the south, is now easy. The opening of the Mexican Central Railroad brings the City of Mexico within seven days of the Eastern United States, and it will not be long before through travel to Guatemala by rail will be possible.

Naturalists need not be reminded of the richness of this magnificent country in all that interests and delights them. The region embraced by it and the republics to the south of it, are characterized by the remarkable variety of their animal and vegetable productions, the number of species of animals, at least, being much greater in a given area than in the North American region. The species of the higher classes are being rapidly made known, but the investigation of those forms of life which require to be studied in the country itself, has scarcely commenced. Both inland and on the sea coast a field lies open which will tempt specialists, and some of our schools of biology will doubtless establish laboratories and inaugurate explorations in the near future. The cheap and good living to be had in the country is not the least of the facilities to be found in Mexico.

—— In his attractive article in the *Contemporary Review* entitled Würzburg and Vienna, M. Laveleye writes of Ludwig Noiré's new book, Das Werkzeug (The Tool) which proves the truth of Franklin's saying: "Man is a tool-making creature." Noiré says that the origin of tools dates from the origin of reason and language. He thus accounts for the origin of language. In the beginning, as far back as we can conceive, man was forced to act on matter to obtain food. This action in nature for the purpose of satisfying wants, is labor. As men were living together in families and in tribes, labor was carried on in common. A person making a muscular effort very naturally pronounces certain sounds in connection with the effort he is making. These sounds, repeated and heard by the entire group, were after a time understood to signify the action of which they were the spontaneous accompaniment. "Thus was language born from natural activity in view of supplying imperious needs, and the verb representing the action preceded all their words. The effort to procure the necessary and useful develops the reasoning powers, and tools soon became necessary. Wherever traces of prehistoric men are found, there is also to be found the flint implement. Thus reason, language, labor and implements, all manifestations of an intelligence capable of progress, appeared almost simultaneously."

In another work, entitled Origin of Speech, Noiré has developed this hypothesis. His book was reviewed by Max Müller, who regarded this view as too exclusive, yet that it was far superior to either the onomatopœia or the interjection theory, and that it was certainly the best and most probable one brought forward at present.

Whether this hypothesis seems plausible or not, would not a comparative study of the physiology of the vocal organs, and of the connection between the brain and the faculty of speech throw light on this problem ? May not the power of speech have been a differentiation of the musical power, and have originated from the play of the intenser emotions or passions rather than from the mechanical movements of the arms or legs in labor?

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RECENT LITERATURE.

THIRD ANNUAL REPORT OF THE U. S. GEOLOGICAL SURVEY.[1]—Succeeding the director's report and those of the chiefs of divisions, are the papers accompanying, and which constitute the main portion of the volume. These are: Birds with teeth, by Professor O. C. Marsh; The copper-bearing rocks of Lake Superior, by R. S. Irving; Sketch of the geological history of Lake Lahontan, by Israel C. Russell; Abstract of the report on the geology of the Eureka district, Nevada, by Arnold Hague; Preliminary paper on the terminal moraine of the second glacial epoch, by T. C. Chamberlain; and a review of the non-marine fossil Mollusca of North America, by C. A. White, M.D.

All of these papers are carefully prepared and elaborately illustrated. In his article on birds with teeth, Professor Marsh concludes that the fact that the three oldest known birds should differ so widely from each other, points unmistakably to a great antiquity for the class. Archæopteryx, Hesperornis and Ichthyornis are all true birds; but the reptilian characters they possess are convergent toward a more generalized type. No Triassic birds are known, and hence we have no light on this stage of the development of the class. They will doubtless be found, however, and if we may judge from Jurassic mammals and reptiles, the next classes above and below birds, the avian forms of that period would still be birds, although with even stronger reptilian features. "For the primal forms of the bird-type, we must evidently look to the Palæozoic; and in the rich land-fauna of our American Permian we may yet hope to find the remains of both birds and mammals."

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[1] *Third Annual Report of the U. S. Geological Survey to the Secretary of the Interior, 1881-'82.* By J. W. POWELL, Director. Washington, 1883. Royal 8vo, pp. 564.